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Applicant: Ian BENDELL et al.

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TRANSLATOR'S DECLARATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I certify that I am familiar with both the German and the English language, that I have reviewed the attached English translation of German priority patent application no. 100 37 384.4, and that the English translation is a true, faithful and exact translation of the corresponding German language paper.

I further declare that all statements made in this declaration of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful, false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful, false statements may jeopardize the validity of legal decisions of any nature based on them.

September 2, 2005
Date

Name: Richard L. Schwaab

Translator's Report/Comments

Your ref: 076776-0115 Your order of (date): July 3, 2001

In translating the above text we have noted the following apparent errors/unclear passages which we have corrected or amended:

Page/para/line*	Comment
1/3/3	bei der → bei denen
3/3/4	sind → ist/sind
4/-1/-2	oder → und
6/1/-1	ist → sind
9/2/3	entsprechen → entspricht

* This identification refers to the source text. Please note that the first paragraph is taken to be, where relevant, the end portion of a paragraph starting on the preceding page. Where the paragraph is stated, the line number relates to the particular paragraph. Where no paragraph is stated, the line number refers to the page margin line number.

Heating and air-conditioning system for a motor vehicle

The invention relates to a heating and air-conditioning system for a motor vehicle, having a conditioning housing in which at least one heat exchanger is integrated and which has a plurality of air outlet openings for guiding air to front interior zones of the motor vehicle.

Such heating and air-conditioning systems are known in general. A heating and air-conditioning system of this type constitutes a simple design, since only temperature control of the front interior zones is possible. An additional temperature control at the rear is not provided. A heating and air-conditioning system of this type is therefore used in particular in relatively small passenger vehicles.

It is also known (DE 197 31 908 A1 or FR 27 78 152 A1 or US 5 862 677 A) to provide heating and air-conditioning systems which are of a more complicated design where in addition to temperature control of the front interior zones, temperature control of the rear interior zones is also provided. The heating and air-conditioning systems illustrated in the abovementioned publications have relatively large conditioning housings in which all of the temperature-control, control and air-guiding functions both for the front interior zones and for the the rear interior zones are

integrated. By means of heating and air-conditioning systems of this type, individual temperature control of the rear region or of the front region of the particular motor vehicle is possible, and so heating and air-conditioning systems of this type are particularly suitable for relatively large passenger vehicles which are equipped to a good standard.

Therefore, different conditioning housings have to be produced and correspondingly fitted, depending on the desired design in the particular motor vehicle.

The object of the invention is to provide a heating and air-conditioning system of the type mentioned at the beginning which, with simple means, is able to be used, depending on requirements, as a system controlling the temperature only at the front or as a system controlling the temperature at the front and rear.

This object is achieved in that the conditioning housing has on the outside a connecting section which is provided with at least one air outlet opening and is intended for connecting to an optionally attachable rear temperature-control unit which, when not in use, can be tightly closed by a releasable covering part. The conditioning housing according to the invention therefore forms a basic module to which a corresponding rear temperature-control unit can be assigned in a

simple manner as an additional module. If, in addition, rear temperature control is also desired, then rather than having to produce a new housing, according to the invention an additional unit has merely to be attached to the existing conditioning housing. The solution according to the invention is therefore suitable both for simple designs where only front temperature control is desired, and also for more complicated designs where a rear temperature control, which in particular can be set individually, is additionally made possible. With a substantially reduced outlay on development and production a front-zone heating and air-conditioning system can therefore be converted into a front- and rear-zone heating and air-conditioning system. As a result, it is also possible, in particular, to retrofit a simple design of a heating and air-conditioning system of this type at a later time. The heating and air-conditioning system may, depending on the design, additionally be provided with a left/right separation both for the front temperature control and for the rear temperature control, in which case independent temperature control is possible for the driver's side and the front-passenger's side. According to the invention, the term temperature control is intended to encompass heating, cooling and simple ventilation.

In a refinement of the invention, an air guiding arrangement leading to the rear is provided as the rear

temperature-control unit. As a result, the rear zone can be ventilated. If a left/right separation of the temperature control is provided at the front, then together with the rear zone a total of three zones are produced which can be individually temperature-controlled.

In a further refinement of the invention, the rear temperature-control unit has an additional housing in which at least one air control element and/or a heat exchanger is/are integrated. The additional housing preferably forms a further air distributing space which, in conjunction with the additional heat exchanger, makes possible individual temperature control of the rear region. If the heat exchanger is provided with a left/right separation, a total of four individually settable temperature-control zones in the front and rear region are provided.

In a further refinement of the invention, the connecting section is substantially larger than the air outlet opening, and the additional housing has an open housing section which can be attached tightly to the connecting section of the conditioning housing. The connecting section which is provided in the region of a housing wall of the conditioning housing therefore also takes on the function of a housing wall for the additional housing, which results in a saving on

construction space.

In a further refinement of the invention, the connecting section and the rear temperature-control unit are provided with mutually corresponding flange profilings which can be fitted together. As a result, a secure positioning and centering of the rear temperature-control unit is obtained. With interposition of suitable sealing means, tight attachment of the rear temperature-control unit to the conditioning housing is therefore ensured. The securing of the tight fit of the rear temperature-control unit to the connecting section is ensured by fastening means engaging in a bonding, frictional or interlocking manner.

In a further refinement of the invention, the heat exchangers are provided with water or air regulating means. In the case of the water regulating means, there are preferably integrated in the heating unit a plurality of PTC elements which can be activated electrically via an electronic regulator. In the case of the air regulating means, the quantity of air flowing through the corresponding heating unit is controlled at the input and/or output of the heating unit by air flaps.

Further advantages and features of the invention emerge

from the claims and from the following description of preferred exemplary embodiments of the invention which are illustrated with reference to the drawings.

Figure 1 shows, in a sectional illustration, a first embodiment of a heating and air-conditioning system according to the invention which undertakes both front and rear temperature control,

Figure 2 shows a heating and air-conditioning system similar to figure 1, which is provided merely for front temperature control,

Figure 3 shows a further embodiment of a heating and air-conditioning system according to the invention similar to figures 1 and 2 with rear ventilation,

Figure 4 shows a further embodiment of a heating and air-conditioning system according to the invention with a combined front and rear temperature control,

Figure 5 shows a detail of a heating and air-conditioning system similar to figure 4 with a rear temperature control,

Figure 6 shows a further embodiment of a heating and air-conditioning system similar to figure 4 with only front temperature control, and

Figure 7 shows a partial section along the sectional line VII-VII of the heating and air-conditioning system according to figure 4.

The heating and air-conditioning systems described below are provided for use in passenger vehicles and are of modular construction enabling different temperature-control variants to be produced. The basic structure and the arrangement of heating and air-conditioning systems in motor vehicles are known, and so in this respect a more detailed explanation is not necessary. The heating and air-conditioning system according to figure 1 has a conditioning housing 1 in which an evaporator 2 is arranged. The evaporator 2 is supplied with air via a fan (not described in greater detail), the air then passing into a first air distributing space 3. A heating unit 4 which is provided with a water regulating means is arranged in an upper part of the housing 1. For this purpose, a regulator 5 is integrated in a water box of the heating unit 4 and is used for the electrical control of PTC heating elements (not illustrated in greater detail) within the heating unit 4. The heating unit 4 and the conditioning housing 1 are provided with a left/right

separation by, as in figure 7, a partition 28 being provided in the conditioning housing 1, said partition making possible independent temperature control on the driver's side and front-passenger's side. Provided in the conditioning housing 1 on the output side of the heating unit 4 is a further air distributing space 6 which conducts the air, which has been temperature-controlled if appropriate by the heating unit 4, to various air outlet nozzles 8, 9, 20 of the front zone of a vehicle interior of the passenger vehicle. For this purpose, corresponding air flaps are provided which are not described in greater detail. The air outlet nozzles 8 lead to the side and central nozzles in the region of the dashboard. The air outlet nozzle 9 leads to defrosting openings below the windshield. The air outlet nozzles 20 are used for the front temperature control of the footwell. Provided parallel to the air distributing space 6 is a cold air duct 7 which can conduct cold air to the air outlet nozzles 8. The latter can be controlled by an air flap 15.

Directly below the air flap 15, an air outlet opening 13 is provided in the conditioning housing 1, said opening being part of a rear connecting section of the conditioning housing 1 - as seen in the normal direction of travel of the passenger vehicle. The air outlet opening 13 is surrounded by flange profilings 14 which are used for centering or positioning various

rear temperature-control units (figures 1 to 3). The upper end of the connecting section of the conditioning housing 1 is provided by the flange profiling 14 on the rear outer wall of the conditioning housing 1, approximately level with the outlet end of the air guiding duct 7 in the conditioning housing 1. An additional housing 10 which is open toward the conditioning housing 1 is attached to the entire connecting section. Therefore, when the additional housing 10 of the rear temperature-control unit is attached, the rear outer wall of the conditioning housing 1 also forms the corresponding wall for the additional housing 10. In addition, in the region of the flange sections 14 which are used for centering and positioning the additional housing 10 on the conditioning housing 1, sealing means are provided which ensure the tight connection of the additional housing 10 to the conditioning housing 1 and the air outlet opening 13. Fastening means (not illustrated in greater detail) are provided for securing the additional housing 10 to the conditioning housing 1 and for securing the tight connection.

The additional housing 10 forms an air distributing box in which a further heating unit 11 according to the illustration according to figure 1 is integrated. The heating unit 11 is likewise provided with a left/right separation, but rather than being regulated by water,

is regulated by air. For this purpose, a distributor flap 12 which can be activated by corresponding control or regulating means is provided in the additional housing 10. The additional housing 10 has a plurality of air outlet nozzles 17, 19 which bring about rear ventilation (air outlet nozzles 17) and footwell ventilation of the rear and a side-window defrosting function (air outlet nozzle 19). For this purpose, a further air flap 16 which undertakes the distribution of air between the footwell, defrosting and ventilation nozzles is provided on the output side of the additional housing 10. The ventilation nozzles, i.e. the air outlet nozzles 17, are connected via corresponding air guiding ducts to rear nozzles which are directed toward the seat positions of the rear passengers. The heating unit 11 is also provided with a left/right separation, so that the heating and air-conditioning system according to figure 1 is a four-zone temperature-control means. This is because in addition to the front region on the driver's side and front-passenger's side, the rear region lying behind the driver's region and the rear region lying behind the front-passenger's region can in each case also be temperature-controlled separately.

In figure 2, a two-zone variant of the conditioning housing 1 according to figure 1 is provided, where the conditioning housing 1 and also all of the functioning

parts present in the conditioning housing 1 correspond to the design according to figure 1. Parts and units which are identical in construction and function are therefore provided with the same reference numbers as in the exemplary embodiment according to figure 1. However, only front temperature control is possible by the heating and air-conditioning system according to figure 2. This is because the air outlet opening 13 arranged below the heating unit 4 and below the air flap 15 is tightly closed here by a cover 18. The cover 18 is provided with plug-in or latching profilings which are matched to the flange profilings 14 of the conditioning housing 1, with the result that a tight fit of the cover 18 in the air outlet opening 13 is ensured. The cover 18 is preferably assigned additional sealing means, which are not described in greater detail. Other covering parts for the solution according to the invention can be formed by cylindrical bodies, such as stoppers or the like.

In the exemplary embodiment according to figure 3, a three-zone variant derived from the heating and air-conditioning system according to figure 1 and from the heating and air-conditioning system according to figure 2 is illustrated. Here, an air guiding arrangement 21 which makes rear ventilation possible is attached in the region of the air outlet opening 13 as the rear temperature-control unit. However, separate and

individual temperature control of the left and right side of the rear compartment is not possible with this. Rather, only cold air which has been cooled by the evaporator 2 can be branched off from the conditioning housing 1 via the air guiding arrangement 21. The footwell of the rear is temperature-controlled by air guiding ducts 20' which originate from the conditioning housing 1 by being branched off from front footwell ducts 20 according to figure 3.

All three heating and air-conditioning systems according to figures 1 to 3 have the same conditioning housing 1, in which case, in order to obtain different temperature-control functions, modifications are merely undertaken in the region of the lower air outlet opening 13 by the air outlet opening 13 either being closed or being connected to an air guiding arrangement 21 (figure 3) or an additional housing 10 (figure 1).

In the heating and air-conditioning system according to figure 4, parts which are identical in function and structure to the exemplary embodiments according to figures 1 to 3 are provided with the same reference numbers. Parts which are only identical in function, but deviate in manner of construction are referred to by the same reference numbers, but with the addition of the letter a. In figure 4, the fan 23 which is positioned on the input side of the evaporator 2 and a

fresh air inlet 22 which is connected upstream of the fan 23 are also illustrated. These components are basically known and so do not have to be discussed in greater detail at this point. Also, those parts of the conditioning housing 1a which are identical in function and/or construction are not described further. Reference is made in this respect to the description of the exemplary embodiments according to figures 1 to 3. In a similar manner to figure 1, an additional housing 10a which is part of a rear temperature-control unit similar to figure 1 is attached to the conditioning housing 1a according to figure 4. It is also true for the rear temperature-control unit that parts which are identical to the exemplary embodiment according to figure 1 are provided with the same reference numbers and parts which are identical in function, but not in construction are provided with the same reference numbers with the addition of the letter a. Reference is therefore additionally made only to figure 7 which, in a plan view, illustrates a cut-open part of the heating and air-conditioning system according to figure 4. From this illustration, the left/right separation in the region of the conditioning housing 1a can be seen by the partition 28 which extends vertically and in the longitudinal direction of the vehicle being illustrated. In addition, it can be seen that the air outlet regions 8a are divided into central nozzles 29 and side nozzles 30.

The function of the rear temperature-control unit having the additional housing 10a and including the air outlet regions 17a and 19a, the distributor flap 12a and the air flap 16 corresponds to the exemplary embodiment according to figure 1, and so for further explanation reference can be made to the exemplary embodiment according to figure 1. The air guiding ducts 20a leading to the front footwell nozzles are indicated merely by dashed lines. The heating and air-conditioning system according to figure 4 therefore likewise constitutes a four-zone variant similar to the heating and air-conditioning system according to figure 1.

The heating and air-conditioning systems according to figures 5 and 6 proceed from a conditioning housing 1a according to figure 4 with an air guiding arrangement 24 being provided in the region of the air outlet opening 13a in the design according to figure 5. Said air guiding arrangement has a housing in which an air flap 27 is integrated. The air guiding arrangement 24 leads to rear nozzles which control the temperature of the seat positions in the rear region. The air flap 27 is used for admixing cold air to the footwell ducts 25 in the rear region, the footwell ducts 25 being branched off from the conditioning housing 1a together with the front footwell ducts 26. Temperature control

is also possible in a similar manner for the rear ventilation nozzles 17a, since the heated up air which is supplied via the rear footwell ducts 25 may, depending on the position of the air flap 27, also be used for temperature control of the air supplied to the rear ventilation nozzles 17a. However, a left and right separation and also, accordingly, independent temperature control of the rear region on the left and right sides is not possible, and so the exemplary embodiment according to figure 5 is a three-zone variant.

In the exemplary embodiment according to figure 6, a two-zone variant similar to the exemplary embodiment according to figure 2 is illustrated. The fact that parts which are identical in function and construction have the same reference numbers and parts which are identical in function, but not in construction have the same reference numbers with the addition of the letter a also holds true here. The air guiding ducts 26 which are branched off from the air distributing space 6a behind the heating unit 4 of the conditioning housing 1a are used for temperature control of the footwell in the front region of the vehicle interior.

The exemplary embodiments according to figures 4 and 6 also proceed in each case from the same basic module, namely the conditioning housing 1a to which different

rear temperature-control units can be connected or whose air outlet opening 13a can be closed by a cover 18a. Depending on the intended use, a two-zone variant, a three-zone variant and a four-zone variant can therefore be realized in a simple manner with the conditioning housing 1a itself not having to be changed.

Patent Claims

1. A heating and air-conditioning system for a motor vehicle, having a conditioning housing in which at least one heat exchanger is integrated and which has a plurality of air outlet openings for guiding air to front interior zones of the motor vehicle, wherein the conditioning housing (1, 1a) has on the outside a connecting section which is provided with at least one air outlet opening (13, 13a) and is intended for connecting to an optionally attachable rear temperature-control unit (10, 21, 10a, 24) which, when not in use, can be tightly closed by a releasable covering part (18, 18a).

2. The heating and air-conditioning system as claimed in claim 1, wherein an air guiding arrangement leading to the rear is provided as the rear temperature-control unit (21, 24).

3. The heating and air-conditioning system as claimed in claim 1, wherein the rear temperature-control unit has an additional housing (10, 10a) in which at least one air control element (12, 12a) and/or a heat exchanger (11) are integrated.

4. The heating and air-conditioning system as claimed in claim 1 or 3, wherein the heat exchanger (4,

11) has a left/right separation.

5. The heating and air-conditioning system as claimed in claim 1, wherein the connecting section is substantially larger than the air outlet opening (13, 13a), and wherein the additional housing (10, 10a) has an open housing section which can be attached tightly to the connecting section of the conditioning housing (1, 1a).

6. The heating and air-conditioning system as claimed in claim 5, wherein the connecting section and the rear temperature-control unit are provided with mutually corresponding flange profilings (14, 14a) which can be fitted together.

7. The heating and air-conditioning system as claimed in one of the preceding claims, wherein the heat exchangers (4, 11) are provided with a water or air regulating means.

Abstract

1. Heating and air-conditioning system for a motor vehicle.

2.1. A heating and air-conditioning system for a motor vehicle having a conditioning housing in which at least one heat exchanger is integrated and which has a plurality of air outlet openings for guiding air to front interior zones of the motor vehicle is known.

2.2. According to the invention, the conditioning housing has a connecting section which is provided with at least one air outlet opening and is intended for connecting to an optionally attachable rear temperature-control unit which, when not in use, can be tightly closed by a releasable covering part.

2.3. For use in passenger vehicles.

3. Figure 1.